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PRELIMINARY INVESTIGATION OF MUNICIPAL AND
INDUSTRIAL WATER SUPPLY AND STREAM QUAL-
ITY CONTROL REQUIREMENTS AND BENEFITS
ASSOCIATED WITH MULTIPLE-PURPOSE STUDIES
OF THE PROPOSED MONMOUTH-DALLAS PROJECT,
POLK COUNTY, OREGON

Public Health Service
Portland, Oregon

April 1962

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COLUMBIA RIVER BASIN PROJECT
For Water Supply and Water Quality Management

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AND BENEFITS ASSOCIATED WITH MULTIPLE-PURPOSE STUDIES
OF THE PROPOSED MONMOUTH-DALLAS PROJECT
FOLK COUNTY, OREGON**

DATE: April 1962

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Region IX

Division of Water Supply and Pollution Control
Room 570 Pittock Block
Portland 5, Oregon

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**REPORT ON WILLAMETTE RIVER BASIN STUDIES
RICKREALL CREEK WATERSHED**

**Preliminary Investigation of Municipal and Industrial
Water Supply and Stream Quality Control Requirements
and Benefits Associated with Multiple-Purpose Studies
of the Proposed Monmouth-Dallas Project
Folk County, Oregon**

**Prepared at the Request of and
in Cooperation with the Area Engineer,
Lower Columbia Development Office,
Bureau of Reclamation, Salem, Oregon**

**U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Public Health Service
Water Supply and Pollution Control Program, Pacific Northwest
Region IX, Portland, Oregon**

April 1962

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INTRODUCTION

This report represents a preliminary examination of present and future municipal and industrial water supply and stream quality control needs in the Rickreall Creek area of the Willamette River Basin with particular reference to the feasibility of including provisions for satisfying these needs in the Bureau of Reclamation's proposed Monmouth-Dallas Project, Folk County, Oregon.

Request for the investigation and report was made by the U. S. Department of the Interior, Bureau of Reclamation, Lower Columbia Development Office, Salem, Oregon by letter dated August 28, 1961 asking for assistance in carrying out provisions set forth in the Water Supply Act of 1958 (Title III, P.L. 500, 85th Congress) for implementation of water supply programs and for an evaluation of needs, requirements, and benefits applicable to flow regulation for control of stream quality as provided in the Federal Water Pollution Control Act Amendments of 1961.

The report identifies uses and sources of water in the project area and describes sources of waste, waste treatment practices and the effects of waste effluents and land drainage materials on the quality of specific reaches of Rickreall Creek.

Included also is a preliminary economic evaluation of the area, the findings of which have formed the basis for estimating future municipal

and industrial water supply needs and for approximating the effects of future wastes and land uses on stream quality.

Since this investigation has been made in advance of study schedules planned for establishment of a Comprehensive Water Supply and Water Quality Control Program for the Columbia River Basin, certain materials presented must necessarily await later confirmation.

It is believed, however, that the conclusions on municipal and industrial water supplies, the low flow requirements for quality control, and benefits as given possess a degree of finality suitable for preliminary project planning and use in determining project feasibilities and justifications.

SUMMARY

1. Whereas Rickreall Creek waters downstream from the City of Dallas are frequently composed only of sewage treatment plant effluent and waters of questionable quality originating from agricultural and other land drainage sources, increased stream flows would be essential to the maintenance of sanitary, aesthetic and aquatic conditions throughout the lower thirteen miles of Rickreall Creek and would improve stream conditions at points of diversion, recreation and population downstream and along the Willamette River.

2. The benefit associated with provisions for maintaining continuous stream flows of 9.5, 11.0 and 13.5 cubic feet per second downstream from Dallas and out through the mouth of Rickreall Creek for the years 1960, 1980 and 2010, respectively, is estimated to be in the order of \$50,000-\$60,000 annually.

PROJECT AREA AND PURPOSE

The Monmouth-Dallas Project is situated in the southeastern corner of Polk County, Oregon. The area is about 12 miles long and 5 to 6 miles wide. The Willamette River flood plain forms the eastern boundary and the low rolling foothills of the Coast Range form the limit on the west. The towns of Monmouth, Independence, and Dallas are the urban centers within the area. About 12,000 acres would come under development.

The purpose of the investigation is to obtain feasibility data on irrigation potentials, drainage requirements, municipal and industrial water supply and stream quality control by low flow augmentation.

Water supplies to the area will be drawn from existing Federal reservoirs, the releases from which will flow down the Willamette River to a point of withdrawal about one mile below the town of Buena Vista. A main pumping plant and canal, two relift plants and an extension canal comprise the major features of the project plan.

STUDY OBJECTIVES AND PROCEDURES

The objective of this study and report is to establish, by use of existing and projected data, preliminary conclusions on the feasibility of providing in the proposed Monmouth-Dallas Project water for municipal and industrial supply and flow regulation for stream quality control and to enumerate where practicable the benefits that would accrue to the project with these purposes included.

Existing sources of municipal and industrial water supply are examined and with projected demand data, the adequacy or suitability of these sources in meeting future demands is estimated. Where warranted, alternate supplies to either replace or supplement the developed sources are identified and explanations are given on procedures to be followed for determining whether use of the Federal project, in lieu of other development possibilities, would be feasible or justified and if so, on what basis benefits may be derived.

Flow regulation requirements relate to the control of specific quality parameters and achievement of specific objectives as governed by the beneficial uses enumerated and the particular quality required to satisfy these uses. Whereas flow regulation for quality control is regarded as a supplement to conventional waste treatment or other measures of control at the source, computations involving needs for additional waste assimilation capacity and dilution in the stream reflect provisions for such treatment. In cases where the quality of irrigation return flows may be suspected of contributing significantly

to reduced stream quality, i.e., nutrient or mineral enrichment (excessive slime and algal growth), toxicity, turbidity, biochemical oxygen demand, etc., a statement to this effect is included with an explanation of the intent of the Public Health Service to conduct studies and surveys at a later date on which to base recommendation for possible further means of control.

Inasmuch as the flow regulation requirements for quality control include allowances for reasonable degrees of waste treatment, the alternate method and hence, the benefit assignable to the storage associated with such regulation is considered equivalent to construction, operation and maintenance costs involved in the development of the least costly single-purpose alternate facility so designed as to provide the recommended regulation. Although, for example, such alternates as waste distillation or underground disposal would accomplish similar control, these methods are not at this time considered to be feasible or equivalent alternates. Annual benefits assignable to the project for quality control, therefore, may be based on amortized costs plus annual operation and maintenance expenses involved in achieving similar regulation by the cheapest single-purpose flow regulation method.

**MOUMOUTH-DALLAS AREA (OREGON)
PRELIMINARY ECONOMIC RECONNAISSANCE
AND ESTIMATE OF GROWTH, 1960-2010**

INTRODUCTION

This analysis is intended to provide a preliminary estimate of anticipated population growth in the portion of Polk County in the area of Dallas and Moumouth.

Several limitations apply to this study. The first is that it is intended only as a preliminary estimate of the outlook for the subject area's growth. Subsequently, in connection with the Columbia River Basin Project for Water Supply and Water Quality Management, an analysis will be made on an industry-by-industry basis of the growth potential in the various sub-basins. At that time, this preliminary estimate will be reviewed, and revised if necessary.

Another limitation is that this study is intended for use particularly in assessing future water needs. Individual industries have been considered only insofar as they may have a significant effect on future population. The study is not submitted as a detailed industrial forecast.

It should also be noted that this study was made before employment data from the 1960 U. S. Census had become available.

Estimates of future population of cities are subject to a wider margin of error than those for areas such as counties or river basins because of the additional variable of possible annexations to the cities.

In the case of the three cities discussed in this report, no attempt has been made to separate the portion of their past growth due to annexations from the portion due to development within previous boundaries. It would appear that there are some limited possibilities for small annexations around each of these three cities in the future. It is assumed, in the following projections, that future growth will represent about the same mixture as it has in the past of (1) annexation and (2) more intensive development of the older area.

PAST GROWTH

Table I shows the history of population growth from 1920-60 in the three cities that are the subjects of the report and the comparable growth in the rest of Polk County. Table II shows this same growth in terms of a percentage rate, compounded annually.

By far the most rapid growth in Polk County has occurred in West Salem. This was part of the national trend toward urbanization, accentuated by the growth of state government employment in Salem. Monmouth has also had above average growth, a result of growing expenditures on education and teacher training--the Oregon College of Education is the principal industry in Monmouth. Dallas, the county seat, grew at the same rate as Polk County as a whole during the period 1920-60. Independence has grown less rapidly than the county as a whole, and actually declined during the decade 1950-60.

Table I
Growth of Population, 1920-60
Principal Cities of Polk County

<u>Area</u>	<u>1920</u>	<u>1930</u>	<u>1940</u>	<u>1950</u>	<u>1960</u>
Dallas	2,701	2,975	3,579	4,793	5,072
Independence	1,143	1,248	1,372	1,987	1,930
Monmouth	582	906	965	1,956	2,229
West Salem	208	974	2,225	3,053	3,897
Rest of County	<u>9,547</u>	<u>10,755</u>	<u>11,848</u>	<u>14,528</u>	<u>13,395</u>
Total County	14,181	16,858	19,989	26,317	26,523

Table II
Rate of Growth of Population, 1920-60
Principal Cities of Polk County
Annual Rate, Compounded Annually, Per Cent

<u>Area</u>	<u>1920-30</u>	<u>1930-40</u>	<u>1940-50</u>	<u>1950-60</u>	<u>(40 years)</u> <u>1920-60</u>
Dallas	1.0	1.9	2.9	0.6	1.6
Independence	0.9	0.9	3.7	-0.3(d)	1.3
Monmouth	1.5	0.6	7.3	1.3	3.4
West Salem	16.7	8.6	3.2	2.5	7.6
Rest of County	<u>1.2</u>	<u>1.0</u>	<u>2.0</u>	<u>-0.8(d)</u>	<u>0.9</u>
Total County	1.7	1.7	2.8	0.1	1.6

(d) Decrease

Table II shows that recent growth in Polk County has been sharply irregular. The decade 1940-50 saw rapid growth in all cities and parts of the county, as agricultural and lumber production increased with the war effort and in-migration to Oregon. During 1950-60, however, total population in the county remained almost stationary. A decline in rural population and in the population of Independence was just offset by increases in urban population, particularly in Salem and Monmouth.

Polk County is part of an area defined, for purposes of the Columbia River Basin Project, as the Mid-Willamette Basin. Table III shows that Polk County's growth lagged behind that of most of the counties in this sub-basin during 1950-60.

Table III
Population Growth in Counties in the
Mid-Willamette Basin, 1950-60
Annual Rate, Compounded Annually, Percent

<u>County</u>	<u>Annual Rate, %</u>
Benton	2.2
Linn	0.8
Marion	1.8
Polk	0.1
Yamhill	<u>-0.3(d)</u>
Total Mid-Willamette Basin	1.2

(d) Decrease

PRESENT ECONOMIC BASE

The difference in growth rates among the various counties shown in Table III can be explained by their respective economic bases. A significant part of the economy of Benton County is associated with Oregon State University, which has had a rapid growth. Marion County's growth has received impetus from employment in state government at Salem. Linn County's growth has been largely due to its relatively diversified economy centered at Albany, where metal research and manufacturing is located. Polk and Yamhill Counties, on the other hand, are dependent almost entirely on agriculture and two types of manufacturing: lumber-wood products and food processing. In Polk County, as of April, 1960, food processing and lumber-wood represented about

80 percent of all manufacturing employment in the county. The only other element in the county's basic economy is the Oregon College of Education at Monmouth, employing about 300 persons.

The economic base of the three cities which are the subjects of this study can be seen more specifically by listing some of their typical manufacturing firms, as shown in Table IV. The table emphasizes their great dependence upon agriculture, food processing and lumber-wood products manufacturing.

Table IV
Selected Manufacturing Firms in
Dallas, Independence and Monmouth, 1961

<u>City</u>	<u>All Manufacturing Firms Employing More than Ten Persons</u>	<u>Number of Employees</u>
Dallas	DeGraff Church Furniture Company	15
	Friesen Core Company (wooden spoons)	11
	Gerlinger Carrier (lumber handling equip.)	252
	LaCreole Lumber Company	17
	Tracy Co. (fruit and vegetable canning)	30 to 130
	Willamette Valley Lumber Company	400
Independence	Holt Equipment Co. (farm and lumber equip.)	85
	Interstate Shingle Company	25
	Mountain Fir Lumber Company	81
	Rain Lumber Company	16
Monmouth	None (Monmouth's economic base is almost entirely dependent on the Oregon College of Education.)	

Source: Oregon State Department of Planning and Development, 1961
Directory of Oregon Manufacturers.

The only other distinctive element in the economic base of any of these cities is the fact that county government is located at Dallas. Each of the cities, of course, derives some support from providing trade and service facilities for the surrounding rural area.

FUTURE GROWTH

An initial appraisal of the outlook for growth in the five counties in the Mid-Willamette Basin^{1/} during 1960-80 is that the rate of increase will be considerably above that of the 1950-60 decade (1.2 percent per year), but less than that of the 1940-50 decade (3.7 percent per year). However, most of this growth is expected to be associated with Salem, Albany, and Corvallis. Polk County is likely to continue to grow at a much slower rate than the Mid-Willamette Basin as a whole. Within Polk County, it appears likely that most of the growth will be in the portion in or near Salem.

Of the three cities under consideration, only Monmouth has a present economic base which appears to be capable of considerable enlargement. Growth at the Oregon College of Education might parallel growth in state population, for which a preliminary estimate is 2.0 percent per year for the period 1960-80, 1.7 percent per year for the period 1980-2000, and 1.5 percent per year for 2000-2010. While the need for teachers may grow more rapidly than population, Monmouth's share of total teacher training in the state may decline with the growth of Portland State College.

^{1/} These preliminary evaluations are based on a judgment of the distribution among the state's sub-basins of population forecasts for the state as a whole.

Dallas' population growth might parallel, as it did over the 1920-60 period, that of Polk County, for which a preliminary estimate is 0.8 percent per year for 1960-80, 0.6 percent for 1980-2010. This rate of growth would be very much higher than Polk County's growth from 1950-60, though only about half of its average for the period 1920-60. Such growth in Dallas would probably be built upon expansion of food processing and wood manufacturing.

Growth for Independence is more difficult to foresee because an economic base upon which such growth might be built does not appear to exist at the present time. Its chief asset is its location on the Willamette. However, above and below it on the Willamette are Albany and Salem, with more attractions for industrial location. For purposes of these projections, it is assumed that Independence might grow at a rate of 0.1 percent per year (the rate for Polk County during 1950-60) during the period 1960-80 and 0.2 percent per year from 1980-2010.

On the basis of these assumptions, the following table shows the future populations of the three cities that might reasonably result.

Table V
Preliminary Projections of Population, 1980 and 2010
Dallas, Independence and Monmouth (Polk County)

<u>Area</u>	<u>1960 Census</u>	<u>1980 Estimate</u>	<u>2010 Estimate</u>
Dallas	5,072	5,900	7,100
Independence	1,930	2,000	2,100
Monmouth	2,229	3,300	5,400

WATER SUPPLY

In considering the Monmouth-Dallas Project as a source of municipal and industrial water supply, it is believed that use of this source in view of those presently available to the cities of Dallas, Monmouth, and Independence would not be feasible. Such factors as anticipated future demands, water treatment costs, and appurtenance involved in the use of project water, have led to this conclusion.

QUALITY CONTROL

Augmentation of low flows in Rickreall Creek downstream from the city of Dallas would be beneficial in alleviating critical stream conditions arising from sewage treatment plant effluents and agricultural and other land drainage materials attributable to an over-appropriation of the natural summer stream flows. For example, the flow in Rickreall Creek at the Dallas sewage treatment plant outfall has been observed to be non-existent during the past two irrigation seasons.

In addition to the use made of Rickreall Creek for carrying pollutional materials, water rights have been issued for domestic, municipal, industrial, irrigation, fish and wildlife uses. The aesthetic, sanitary and quality values associated with these and other uses including non-fishing recreation in downstream Rickreall Creek and Willamette River areas would appear to justify provisions for stream quality maintenance in this area.

It is believed that minimum stream flows to maintain dissolved oxygen levels in Rickreall Creek of no less than six parts per million would offer the extent of quality maintenance necessary to protect all water uses. Following are the minimum rates of stream flow estimated to achieve this objective between the Dallas waste outfall and mouth of Rickreall Creek:

<u>Year</u>	<u>Minimum Flow Requirement</u>
	<u>c.f.s.</u>
1960	9.5
1980	11.0
2010	13.5

A study of available stream flow data indicates that these flows would be required from June 1 through October 15. It should be understood that the extent of regulation required to maintain suitable dissolved oxygen levels would provide, by means of dilution and increased assimilative capacity, significant control of the effects of land drainage as well as control of the effects of residual materials not removed from wastes by known conventional treatment means.

DISCUSSION

The protection of public health through the provision of a safe water supply has long been a matter of primary concern to the public health profession and has been a significant contributing factor to the high health standards of the Nation. However, the problem of providing adequate amounts of safe potable water has become increasingly difficult due to the pyramiding water demands of a rapidly expanding population. Furthermore, the resulting increase in waste flows has caused a gradual degradation in the quality of the Nation's waters. While improved methods of treatment and disinfection of both wastes and water have served to maintain the quality within tolerable limits, the progress in pollution abatement and water treatment has not kept pace with this population growth and industrial expansion.

The familiar problems of pollution by bacteria, organic matter, and chemicals of known toxicity and behavior have been further intensified and complicated by problems of mineral enrichment due to water reuse and by new types of contaminants associated with our chemical and atomic age. The effects of these newer contaminants on water treatment processes and on the human consumer are largely unknown. The deficiencies in knowledge and the prospect of even greater quantities of yet more complex pollutorial materials reaching our surface waters emphasize the urgency of intelligent water quality management.

It is recognized that water for human consumption holds the highest priority of all water uses. The increased demands on quantity by an increasing variety of uses has also brought about many conflicts which can be solved only by intelligent and long-range management practices. Unfortunately, practically every water use results in some degradation of quality. As the supply becomes more critical and conflicts in use increase, water quality is assuming increasing importance.

Where alternate sources are available it is desirable to reserve the highest quality water available for domestic use and to satisfy other lower priority demands with waters of lesser quality. In areas of limited supply the ultimate water requirements can be met only by water reuse. Thus, dependence must be placed upon improved and more effective methods of water and waste treatment and other control methods in order to maintain the highest possible standards of quality for human consumption and other uses. However, in such instances every effort should still be made to reserve a sufficient quantity of high quality natural waters for domestic use before they flow on to supply other less critical demands.

It is sound planning to utilize highest quality water for highest priority uses, and the protection of this quality against irreversible and potentially hazardous degradation must be practiced to the fullest extent possible.

Inasmuch as maintenance of a high level of water quality for all uses is basic to public health and the general well-being of the populations and economy, planning for future water demand and uses requires the utmost of care with application of a reasonable degree of optimism. This is especially true when planning for needs many years in advance as is the objective of this evaluation.

Although the Rickreall Creek Watershed and Monmouth-Dallas area constitute only a very small fraction of the Willamette River Basin system and area within the State of Oregon, its importance as a potential and growing contributor to the widespread economy of the region is believed sufficient to justify, where reasonable and practicable, provisions for maintaining an acceptable sanitary environment and a means whereby the water resource may be preserved for the continuance and expansion of any and all legitimate and/or riparian purposes.

Whereas Rickreall Creek waters downstream from the City of Dallas are frequently composed only of sewage treatment plant effluent and waters of questionable quality originating from agricultural drainage and other land sources, provisions for increased stream flows by use of higher quality waters from any available or reasonable source would introduce dilution factors and natural self-purification properties essential to the maintenance of satisfactory sanitary, aesthetic and aquatic conditions throughout the lower thirteen miles of Rickreall Creek and would improve conditions at points of diversion, recreation and population downstream and along the Willamette River.

It is believed that the Bureau of Reclamation's Monmouth-Dallas Project could be designed to include stream quality control as a project function and that benefits accruing from such provisions could be applied toward project justification, especially as waters pumped from the Willamette River to the project area are associated with upstream storage.

Inasmuch as the minimum flows established for Rickreall Creek incorporate provisions for conventional waste treatment (85 percent BOD reduction) in meeting quality objectives, and reasonable or equivalent alternatives other than increased stream flow are not available to supplement this treatment, it is suggested that the benefit associated with low flow augmentation for quality control, in the absence of an evaluation of direct benefits, be the equivalent of single-purpose costs to provide the required regulation.

It is recognized as only problematical that in the absence of the Bureau project, increased stream flow in addition to waste treatment and control of land drainage effects would be provided on a local level. It is believed less probable, however, that methods of control such as waste distillation, underground disposal (this would interfere with downstream water rights), or auxiliary waste treatment would be provided in the absence of the project.

Benefits derived from single-purpose costs to provide increased stream flow, however, should be tempered or substantiated by judgment based

on beneficial uses of the stream, land values to be protected, and relative importance of the resource to the economy and well-being of the particular region.

It is suggested, even though waste distillation and auxiliary waste treatment may be unrealistic, that these costs and equivalent effects be compared with single-purpose costs to develop stream flow for purposes of facilitating further judgment in the assessment of reasonable benefits. It is estimated, for example, that costs to treat the projected Dallas treatment plant effluent by distillation as this process is now known, would range in the neighborhood of \$182,000 to \$363,000 annually. Auxiliary treatment of Dallas wastes based on the difference in cost between primary and secondary waste treatment for further removal of biochemical oxygen demand is estimated to range from \$10,000 to \$15,000 annually and the least costly single-purpose development of increased stream flow (pumping project from Willamette River) as determined by the Bureau of Reclamation is estimated to be \$62,200 annually. Neither the distillation nor auxiliary treatment method would provide the kind or extent of quality maintenance that would be achieved by increased stream flow.

In view of the many uses made of Rickreall Creek, the relative reliance of the area on a protected water resource, and the relationships of the area to downstream Willamette River conditions and activities, it is suggested that the benefit assignable to the proposed Monmouth-Dallas Project for quality control be in the order of \$50,000 to \$60,000 annually.